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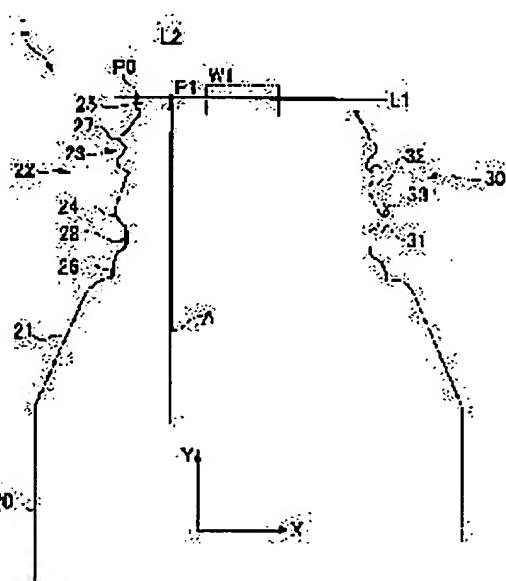
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(54) METHOD OF MEASURING BOTTLE CAN

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method by which each part of a bottle can be precisely measured at a high speed.

SOLUTION: The bottle can 1 is image-picked up with an image picking-up means, one portion of an image signal is area-set about the obtained image signal, the change of signal intensity in the image signal is detected, and a portion changed in signal intensity is captured as the outline of the bottle can 1, the top face of an opening part in the can 1 is set as a reference measuring line L1, based on the outline, and a dimension of the each part in the can 1 is measured using reference measuring line L1 as a reference.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the measuring method of the bottle can which measures the dimension of each part of a bottle can.

[0002]

[Description of the Prior Art] In recent years, in addition to a PET bottle, the bottle can which consists of an aluminium alloy etc. has spread widely as a container with which it fills up with soft drinks etc. the mouthpiece of the minor diameter where this bottle can was formed in the drum section of a major diameter, and the upper limit section of this drum section -- from the section -- becoming -- this mouthpiece -- the screw section is formed in the section and it has at it the composition that a cap is screwed on this screw section. usually -- while this bottle can processes the aluminium alloy formed disc-like by spinning and ironing, forms a closed-end cylindrical shape-like can, carrying out neck-in processing of the upper limit section of this can and narrowing down to a minor diameter -- a mouthpiece -- the section -- forming -- further -- a mouthpiece -- it is manufactured by forming the screw section in the section.

[0003] In the production process of this bottle can, the dimension of each part of the bottle can manufactured needs to check whether it has agreed in the specification. especially -- a bottle can -- a mouthpiece -- a mouthpiece since a cap is put and fixed to the section -- the dimensional accuracy of each part of the section is important. It was what measures each part by making contact for measurement contact each part of a bottle can, and detecting contact of this contact, un-contacting, or its variation rate as a means to perform this measurement, conventionally.

[0004]

[Problem(s) to be Solved by the Invention] By the way, while measurement by contact had to be repeated repeatedly and measurement took the long time when many measurement parts were measured since it was the approach of making contact for measurement contacting a bottle can physically, if it was in the above-mentioned conventional measuring method, the measurement result also had the problem which is not acquired with high degree of accuracy. furthermore, the thing which this bottle can forms a closed-end cylindrical shape-like can by spinning and ironing at the beginning, and is further done for neck-in processing of this can as mentioned above -- a mouthpiece -- since [which is referred to as forming the section] it is greatly manufactured according to two processes -- the axis of a can drum section, and a mouthpiece -- the axis of the section shifts and may be formed the case where it measures without taking this point into consideration -- a bottle can -- a mouthpiece -- there was a problem which cannot measure the dimension of each part of the section correctly.

[0005] This invention was made in consideration of such a situation, and aims at offering the measuring method of the bottle can which makes each part of a bottle can measurable [at high speed] with high precision.

[0006]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem and to attain

such a purpose, this invention has proposed the following means. Invention concerning claim 1 is a measuring method which measures the dimension of each part of a bottle can, it picturizes the above-mentioned bottle can with an image pick-up means, **** the border line of this bottle can, and is characterized by measuring the dimension of each part of this bottle can based on this border line.

[0007] In order to measure the dimension of each part of a bottle can based on the border line picturized with the image pick-up means according to the measuring method of the bottle can concerning this invention, highly precise measurement is made in an instant, without giving contact of a physical gauge head etc. to a bottle can.

[0008] In the measuring method of a bottle can according to claim 1, invention concerning claim 2 makes the opening top panel of the above-mentioned bottle can a criteria measurement line, **** it, and is characterized by measuring the dimension of each part of this bottle can on the basis of this criteria measurement line.

[0009] in order to make the opening top panel of a bottle can into a criteria measurement line according to the measuring method of the bottle can concerning this invention -- the axis of a drum section peculiar to a bottle can -- receiving -- a mouthpiece -- the case where the axis of the section has shifted -- especially -- a mouthpiece -- the measurement in each part of the section is made very with high precision.

[0010] Invention concerning claim 3 is [0011] characterized by detecting change of the signal strength within this picture signal, and detecting the part by change of this signal strength as a border line of this bottle can in the measuring method of a bottle can according to claim 1 or 2 about the picture signal acquired by the above-mentioned image pick-up means while carrying out a field setup of this a part of picture signal. Since according to the measuring method of the bottle can concerning this invention the border line of a bottle can is detected based on change of the signal strength of the above-mentioned picture signal and a border line is detectable with high degree of accuracy, each part of a bottle can is measured with high degree of accuracy.

[0012] invention concerning claim 4 -- the measuring method of a bottle can according to claim 3 -- setting -- the part of 1 of the above-mentioned picture signal -- a field setup -- carrying out -- this -- the border line of the part of 1 -- detecting -- the part of 2 of the above-mentioned picture signal -- a field setup -- carrying out -- this -- the border line of the part of 2 is detected and it is characterized by making the intersection of each production of the border line of the part of these 1, and the border line of the part of 2 into point of measurement.

[0013] Since the intersection of the border line of the part of 1 and the border line of the part of 2 is made into point of measurement, while the criteria of measurement become clear according to the measuring method of the bottle can concerning this invention, measurement of a detailed part is attained.

[0014] Invention concerning claim 5 is set for the measuring method of a bottle can given in either of claims 1-4. While picturizing the above-mentioned bottle can from the upper part, obtaining the image of the opening top panel of a bottle can and passing along the center line of this bottle can about the picture signal of this top panel It is characterized by setting two or more horizontal lines which were able to shift the location as the hoop direction of this bottle can, measuring the bore or outer diameter of this each part of a bottle can on these two or more horizontal lines, averaging these bores and an outer diameter and measuring the bore or outer diameter of this part.

[0015] According to the measuring method of the bottle can concerning this invention, it becomes possible to measure easily the bore and outer diameter of a bottle can which were picturized from the upper part.

[0016] invention concerning claim 6 -- the measuring method of a bottle can given in either of claims 1-5 -- setting -- the mouthpiece of the above-mentioned bottle can -- it is characterized by measuring the dimension of each part of this bottle can on the basis of the screw beginning section of the screw section formed in the section.

[0017] According to the measuring method of the bottle can concerning this invention, in order to consider the criteria of measurement as the screw beginning of the screw section, measurement clear

[the criteria of measurement] and always highly precise is made.

[0018]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained with reference to a drawing. Drawing 20 shows 1 operation gestalt of this invention from drawing 1. The outline configuration of equipment for drawing 1 and drawing 2 to enforce the measuring method of the bottle can by this invention is shown. In these drawings, the bottle can and sign 2 from which a sign 1 serves as the measuring object-ed are a measuring device.

[0019] the drum section 20 formed in the upper limit of the drum section 20 of a major diameter, the shoulder 21 which goes to the upper part from drum section 20 upper limit, and whose diameter boil, and follow and is reduced gradually, and a shoulder 21 as the bottle can 1 was shown in drawing 6 -- the mouthpiece of a minor diameter -- it mainly consists of the sections 22. a mouthpiece -- the screw section 23, the skirt-board section 24, and the bulge section 26 form in the periphery section of the section 22 -- having -- a mouthpiece -- the curl section 25 which turned up the upper limit edge of the bottle can 1 is formed in the section 22 upper-limit section. Opening of the inside of the curl section 25 is carried out, and it calls the upper limit edge of the curl section 25 an opening top panel hereafter. Here, the skirt-board section 24 is a part which puts the temper shrimp DENSU section 31 of cap 30. namely, the mouthpiece of the bottle can 1 -- the cap 30 put on the section 23 consists the fracture section 33 of the temper shrimp DENSU section 31 by which connection formation was carried out in preparation for the lower limit section of the body 32 of a cap screwed on by blockading the opening top panel of the bottle can 1, and the body 32 of a cap, and has the composition of stopping the temper shrimp DENSU section 31 by the skirt-board section 24. Moreover, as shown in drawing 20 , in the upper part of the screw section 23, the part 27 in which the screw width of face a begins to be formed clearly is hereafter called screw beginning.

[0020] In drawing 1 and drawing 2 , the measuring device 2 consists of the table 50 holding the bottle can 1, the camera 51 arranged above the bottle can 1, cameras 52 and 53 arranged at the method of the outside of a side face of the bottle can 1, lighting systems 54, 55, and 56 formed corresponding to each cameras 51, 52, and 53, and a control section 57 which controls each above-mentioned component. The table 50 consists of [axis / the] rotary tables 59 rotated as a core in the rise-and-fall table 58 made to move the bottle can 1 in the vertical direction, and the bottle can 1.

[0021] Moreover, the lighting system 54 is formed annularly and the camera 51 is formed caudad. A camera 51 lets the interior of a lighting system 54 pass, and has composition which can picturize the bottle can 1 from the upper part. Lighting systems 55 and 56 are formed so that it may counter with cameras 52 and 53 on both sides of the bottle can 1. At this time, cameras 52 and 53 are arranged in the location estranged 120 degrees centering on the revolving shaft of the measurement table 50. in this case, the camera 52 -- the bottle can 1 -- especially -- a mouthpiece -- it is arranged so that the section 22 may be aimed at and it can picturize, and the camera 53 is arranged so that a shoulder 21 may be aimed at and it can picturize from the upper part of the drum section 20 of the bottle can 1. In addition, to the bottle can 1, arrangement of the camera 52 will be carried out soon at the bottle can 1, and the camera 53 is estranged and arranged from the bottle can 1 from the camera 52.

[0022] The bottle can 1 laid on the table 50 as shown in drawing 1 and drawing 2 has composition picturized by coincidence with cameras 51, 52, and 53. It has composition which it rotates 120 degrees at a time to the circumference of the axis, measures the bottle can 1 similarly after the end of measurement by this image pick-up, and measures the parameter which will explain three places below on the periphery of the bottle can 1 by the time 240 degrees of bottle cans 1 rotate to the circumference of the axis.

[0023] In the gestalt of this operation, the item to measure is 14 items shown in drawing 5 . That is, they are the overall length of a can, a head, skirt-board die length, curl width of face, screw thread height, a curl bore and roundness, a curl outer diameter, a screw thread outer diameter, a skirt-board outer diameter, a skirt-board root diameter, a skirt-board include angle, screw beginning height, and neck length. Measurement of a curl bore and roundness is made with a camera 51 among these parameters, the overall length of a can, a head, skirt-board die length, curl width of face, screw thread height, a curl

outer diameter, a screw thread outer diameter, a skirt-board outer diameter, a skirt-board root diameter, a skirt-board include angle, and screw beginning height are measured with a camera 52, and neck length is further measured with a camera 53.

[0024] As shown in drawing 3, cameras 51, 52, and 53 perform these measurement by picturizing three points on the periphery of the bottle can 1, and it is measured by processing these image pick-up results in a control section 57. That is, the border line of the bottle can 1 is ****(ed) from the above-mentioned image pick-up result, and the dimension of each part of the bottle can 1 is measured based on this border line. Moreover, this measuring method makes the opening top panel of the bottle can 1 a criteria measurement line, **** it, and mainly measures it on the basis of this criteria measurement line.

[0025] the bottle can 1 laid in the table 50 in the measuring device 2 constituted as mentioned above as shown in drawing 3 -- first -- the top face of the bottle can 1 -- the point of measurement 3 of the bottle can 1 is picturized for the point of measurement 1 of the bottle can 1 to coincidence with a camera 53 a camera 52 with a camera 51. The bottle can 1 rotates to 120-degree clockwise rotation on a table 59 after the end of measurement at the circumference of the axis, and the point of measurement 2 of the bottle can 1 is picturized for the point of measurement 1 of the bottle can 1 to coincidence with a camera 52 a camera 53. After the end of measurement, further, the bottle can 1 rotates to 120-degree clockwise rotation at the circumference of the axis, and picturizes the point of measurement 2 of the bottle can 1 for the point of measurement 3 of the bottle can 1 to coincidence with a camera 53 a camera 52. By this, all the above-mentioned measurement will be made in three places on the periphery of the bottle can 1. Here, among the above-mentioned parameters, since it is only that one place exists on the periphery of the bottle can 1, screw beginning height is measured only in the point of measurement 1 in the case of 0 degree of angles of rotation. Measurement of each part is explained concretely below.

[0026] First, the bottle can 1 with which positioning of the hoop direction was made beforehand is laid on a table 50 with other equipments which are not illustrated. At this time, the bottle can 1 is arranged in the location which 90 degrees of that screw beginning section 27 estranged to the camera 52. And a normal coordinate is set up about the picture signal which ****(ed) with the camera 52. In this normal coordinate, the border line of the bottle can corresponding to the specification of the bottle can 1 measured is set up on a coordinate. Thus, after setting up, the border line of the actual bottle can 1 is ****(ed).

[0027] [measurement of a can overall length] -- in this condition, in measurement of the can overall length A, as first shown in drawing 6, a field W1 is set up near the bottle can 1 opening top panel near the medial axis of the bottle can 1. While obtaining the image data of a bottle can 1 opening top panel with the above-mentioned equipment 2 in a field W1, the criteria measurement line L1 is set up from change of the signal strength of this image data. That is, in the above-mentioned equipment 2, since a lighting system 55 is in a camera 52 and the location which counters as shown in drawing 1, the picture signal acquired with a camera 52 is a picture signal with which the silhouette of the bottle can 1 appeared in light. Therefore, the criteria measurement line L1 is called for by detecting change of this picture signal reinforcement, i.e., the change part of brightness. Let the criteria measurement line L1 be the criteria in each measurement mentioned later besides the can overall length A. In order to compute the can overall length A from this criteria measurement line L1, first, an apparent vertical L2 is drawn a little in the location of the inner direction from the opening top panel left end P0 of the bottle can 1, and the Y coordinate value of the intersection P1 of the criteria measurement line L1 and an apparent vertical L2 is measured after that. The difference of the Y coordinate value at this time and the criteria Y coordinate value equivalent to the height corresponding to the specification of the bottle can 1 is computed, and an overall length A is computed by adding this calculation result to the module corresponding to the specification of the bottle can 1.

[0028] Since it measures by obtaining an image by the image pick-up with a camera 52 according to this measuring method, compared with the measuring method which contacts a gauge head with the bottle can 1 physically, it is highly precise and measuring for a short time is possible. Moreover, since it is based on screw beginning, it becomes possible to carry out measurement clear [the criteria of measurement], and always highly precise.

[0029] the mouthpiece of the following and bottle can 1 -- although the section 22 and each part of the near are measured, axis doubling of the bottle can 1 is performed before that. that is, the bottle can 1 was mentioned above -- as -- the beginning -- spinning and ironing -- a drum section 20 -- forming -- after that and neck-in processing -- a mouthpiece -- in order to form the section 22 -- the time of both processings -- setting -- a drum section 20 and a mouthpiece -- the case where the axis of the section 22 shifts -- it is -- this condition shifted -- it is -- a mouthpiece -- when measurement of the section 22 and its near is performed, there is a problem from which a suitable measurement result is not obtained.

[0030] In order to solve this problem, in the following measurement, it measures on the basis of the opening top panel L1, i.e., a criteria measurement line. that is, a setup of a coordinate is changed as shown in drawing 7 (A) and (B) -- making -- the criteria measurement line L1 -- a level coordinate -- carrying out -- a bottle can -- let the axis M of the section 22 be a vertical coordinate 1 mouthpiece.

[0031] A camera 53 performs measurement of [measurement of neck length] neck die-length B. First, as shown in drawing 8 , like the approach of obtaining the criteria measurement line L1 mentioned above, a field W2 is set as a shoulder 21, the tangent of this border line is extended by making the change part of brightness into a border line, and L2 is specified. Furthermore, similarly, W3 is set as a drum section 20 for a field, and L3 is specified. The intersection P2 with the above L2 and L3 is made into the intersection of a shoulder 21 and a drum section 20, and the neck length B is computed from the difference of the Y coordinate value of the above L1 and P2.

[0032] A camera 52 performs [measurement of head] head's C measurement. As shown in drawing 9 , first, a field W5 is set as the bulge section 26, and a field W6 is set as the bend of the upper limit of a shoulder 21, respectively. The change part of a picture signal is made into a border line into these fields W5 and W6, the productions L4 and L5 of this border line are obtained, and an intersection with these [L4 and L5] is set to P3. The difference of a Y coordinate value with the above L1 and P3 is calculated, and Head C is computed.

[0033] A camera 52 performs measurement of [measurement of skirt-board height] skirt-board height D. As shown in drawing 10 , first, a field W6 is set as the skirt-board section 24, change of a picture signal, i.e., change of brightness, is detected in a field W6, the border line of this part is ****(ed), and the high-order end P4 in the maximum tip section, i.e., drawing 10 , is specified in this border-line top. The difference of a Y coordinate value with the above L1 and P4 is calculated, and skirt-board height D is computed.

[0034] A camera 52 performs measurement of [measurement of curl width of face] curl width of face E. As shown in drawing 11 , first, a field W7 is set as a curl part, a border line is ****(ed) by the change part of a picture signal, i.e., change of brightness, in a field W7, and right end P5 are specified in the point, i.e., drawing 11 , of being most located on this border line in the inner direction. The difference of a Y coordinate value with the above L1 and P5 is calculated, and the curl width of face E is computed.

[0035] A camera 52 performs measurement of [measurement of screw thread height] screw thread height F. drawing 12 -- being shown -- as -- first -- a screw -- the section -- 23 -- a field -- W -- eight -- setting up -- a picture signal -- change -- namely, -- brightness -- change -- detecting -- this -- a part -- a border line -- ****(ing) -- this -- a border line -- inside -- two or more -- it is -- a screw thread -- a crowning -- inside -- drawing 12 -- setting -- a crowning -- P -- six -- P -- six -- ' -- inside -- most -- outside -- a way -- projecting -- a part -- namely, -- a high-order end -- P -- six -- ' -- detecting . Next, P7' most located in the inner direction among the troughs which have more than one is detected. And the difference of the X coordinate value of P6' and P7' is calculated, and screw thread height F is computed.

[0036] [measurement of a curl section bore and roundness] -- a mouthpiece -- as shown in drawing 1 , measurement of curl section 25 bore of the section 22 picturizes the bottle can 1 from the upper part with a camera 51, and obtains the image of opening 25 top panel shown in drawing 13 (A) and (B). In this image, while passing along the center line O of the bottle can 1, a location can be shifted to the hoop direction of the bottle can 1, and a horizontal line 40 and the bore of the curl [set up 41...64 and] section 25 on the horizontal line of these plurality are measured, these bores are averaged, and it considers as the bore of the curl section 25. Among this average and the bore obtained by the above-mentioned measurement, a difference with maximum and the minimum value is calculated, and

roundness is computed. In addition, although the bore of the curl section 25 was measured, you may make it measure the outer diameter of the curl section 25 in this example of measurement. furthermore, a mouthpiece -- it is possible to measure similarly about paths of each part, such as an outer diameter of not only the section 22 but the drum section 20.

[0037] A camera 52 performs measurement of the [measurement of curl section outer diameter] curl section 25 outer diameter G. Like ****, as shown in drawing 14, fields W9 and W10 are set as one edge and other end of the curl section 25, respectively, and a border line is ****(ed) in each of this field W9 and W10, respectively. The opening 25 outer diameter G is computed from the X coordinate value of the high-order end in the field W9 on this border line, and the right end in a field W10.

[0038] A camera 52 performs measurement of [measurement of screw thread outer diameter] screw thread outer diameter H. Like ****, as shown in drawing 15, fields W11 and W12 are set to one edge of the screw section 23, and the edge of the other end, respectively, and a border line is ****(ed) in this field W11 and W12, respectively. It sets to drawing 15 and the screw thread outer diameter H is computed from the X coordinate value of the high-order end P10 in the field W11 on this border line, and right end P11 in a field W12.

[0039] A camera 52 performs measurement of [measurement of skirt-board outer diameter] skirt-board outer diameter I. Like ****, as shown in drawing 16, fields W13 and W14 are set to one edge of the skirt-board section 24, and the edge of the other end, respectively, and a border line is ****(ed) in this field W13 and W14, respectively. The bulge section outer diameter I is computed from the X coordinate value of the high-order end P12 in the field W13 on this border line, and right end P13 in a field W14.

[0040] A camera 52 performs measurement of [measurement of skirt-board root diameter] skirt-board root diameter J. Like ****, as shown in drawing 17, fields W15 and W16 are set to one edge of the skirt-board trough 28, and the edge of the other end, respectively, and a border line is ****(ed) in this field W15 and W16, respectively. The skirt-board root diameter J is computed from an X coordinate value with the high-order end P15 in right end P14 and the field W16 in the field W15 on this border line.

[0041] A camera 52 performs measurement of [measurement of skirt-board include angle] skirt-board include angle theta. Like ****, as shown in drawing 18, a field W17 is set to the lower limit section side of the skirt-board section 24, and a border line is ****(ed) in a field W17. Production L6 of the tangent of this border line is set up, and the include angle of the above L1 and L6 to accomplish is computed as a skirt-board include angle theta.

[0042] A camera 52 performs measurement of [measurement of screw beginning height] screw beginning height K. Like ****, as shown in drawing 19, a field W18 is set up near the screw beginning section 27, and a border line is ****(ed) in a field W18. In the maximum tip section in the field W18 on this border line, i.e., drawing 19, screw beginning height K is computed from the Y coordinate value of a high-order end P14 and the above L1.

[0043]

[Effect of the Invention] In order to measure the dimension of each part of a bottle can based on the border line picturized with the image pick-up means according to invention concerning claim 1 so that clearly from the above explanation, it becomes possible to carry out measurement highly precise in an instant, without giving contact of a physical gauge head etc. to a bottle can.

[0044] in order to make the opening top panel of a bottle can into a criteria measurement line according to invention concerning claim 2 -- the axis of a drum section peculiar to a bottle can -- receiving -- a mouthpiece -- the case where the axis of the section has shifted -- especially -- a mouthpiece -- it becomes possible to carry out measurement in each part of the section with high precision.

[0045] Since according to invention concerning claim 3 the border line of a bottle can is detected based on change of the signal strength of the above-mentioned picture signal and a border line is detectable with high degree of accuracy, it becomes possible to measure each part of a bottle can with high precision.

[0046] Since the intersection of the border line of the part of 1 and the border line of the part of 2 is made into point of measurement, while the criteria of measurement become clear according to invention

concerning claim 4, measurement of a detailed part is attained.

[0047] According to invention concerning claim 5, it becomes possible to measure easily the bore and outer diameter of a bottle can which were picturized from the upper part.

[0048] According to invention concerning claim 6, in order to consider the criteria of measurement as the screw beginning of the screw section, it becomes possible to carry out measurement clear [the criteria of measurement], and always highly precise.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem and to attain such a purpose, this invention has proposed the following means. Invention concerning claim 1 is a measuring method which measures the dimension of each part of a bottle can, it picturizes the above-mentioned bottle can with an image pick-up means, **** the border line of this bottle can, and is characterized by measuring the dimension of each part of this bottle can based on this border line.

[0007] In order to measure the dimension of each part of a bottle can based on the border line picturized with the image pick-up means according to the measuring method of the bottle can concerning this invention, highly precise measurement is made in an instant, without giving contact of a physical gauge head etc. to a bottle can.

[0008] In the measuring method of a bottle can according to claim 1, invention concerning claim 2 makes the opening top panel of the above-mentioned bottle can a criteria measurement line, **** it, and is characterized by measuring the dimension of each part of this bottle can on the basis of this criteria measurement line.

[0009] in order to make the opening top panel of a bottle can into a criteria measurement line according to the measuring method of the bottle can concerning this invention -- the axis of a drum section peculiar to a bottle can -- receiving -- a mouthpiece -- the case where the axis of the section has shifted -- especially -- a mouthpiece -- the measurement in each part of the section is made very with high precision.

[0010] Invention concerning claim 3 is [0011] characterized by detecting change of the signal strength within this picture signal, and detecting the part by change of this signal strength as a border line of this bottle can in the measuring method of a bottle can according to claim 1 or 2 about the picture signal acquired by the above-mentioned image pick-up means while carrying out a field setup of this a part of picture signal. Since according to the measuring method of the bottle can concerning this invention the border line of a bottle can is detected based on change of the signal strength of the above-mentioned picture signal and a border line is detectable with high degree of accuracy, each part of a bottle can is measured with high degree of accuracy.

[0012] invention concerning claim 4 -- the measuring method of a bottle can according to claim 3 -- setting -- the part of 1 of the above-mentioned picture signal -- a field setup -- carrying out -- this -- the border line of the part of 1 -- detecting -- the part of 2 of the above-mentioned picture signal -- a field setup -- carrying out -- this -- the border line of the part of 2 is detected and it is characterized by making the intersection of each production of the border line of the part of these 1, and the border line of the part of 2 into point of measurement.

[0013] Since the intersection of the border line of the part of 1 and the border line of the part of 2 is made into point of measurement, while the criteria of measurement become clear according to the measuring method of the bottle can concerning this invention, measurement of a detailed part is attained.

[0014] Invention concerning claim 5 is set for the measuring method of a bottle can given in either of claims 1-4. While picturizing the above-mentioned bottle can from the upper part, obtaining the image

of the opening top panel of a bottle can and passing along the center line of this bottle can about the picture signal of this top panel It is characterized by setting two or more horizontal lines which were able to shift the location as the hoop direction of this bottle can, measuring the bore or outer diameter of this each part of a bottle can on these two or more horizontal lines, averaging these bores and an outer diameter and measuring the bore or outer diameter of this part.

[0015] According to the measuring method of the bottle can concerning this invention, it becomes possible to measure easily the bore and outer diameter of a bottle can which were picturized from the upper part.

[0016] invention concerning claim 6 -- the measuring method of a bottle can given in either of claims 1-5 -- setting -- the mouthpiece of the above-mentioned bottle can -- it is characterized by measuring the dimension of each part of this bottle can on the basis of the screw beginning section of the screw section formed in the section.

[0017] According to the measuring method of the bottle can concerning this invention, in order to consider the criteria of measurement as the screw beginning of the screw section, measurement clear [the criteria of measurement] and always highly precise is made.

[0018]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained with reference to a drawing. Drawing 20 shows 1 operation gestalt of this invention from drawing 1. The outline configuration of equipment for drawing 1 and drawing 2 to enforce the measuring method of the bottle can by this invention is shown. In these drawings, the bottle can and sign 2 from which a sign 1 serves as the measuring object-ed are a measuring device.

[0019] the drum section 20 formed in the upper limit of the drum section 20 of a major diameter, the shoulder 21 which goes to the upper part from drum section 20 upper limit, and whose diameter boil, and follow and is reduced gradually, and a shoulder 21 as the bottle can 1 was shown in drawing 6 -- the mouthpiece of a minor diameter -- it mainly consists of the sections 22. a mouthpiece -- the screw section 23, the skirt-board section 24, and the bulge section 26 form in the periphery section of the section 22 -- having -- a mouthpiece -- the curl section 25 which turned up the upper limit edge of the bottle can 1 is formed in the section 22 upper-limit section. Opening of the inside of the curl section 25 is carried out, and it calls the upper limit edge of the curl section 25 an opening top panel hereafter. Here, the skirt-board section 24 is a part which puts the temper shrimp DENSU section 31 of cap 30. namely, the mouthpiece of the bottle can 1 -- the cap 30 put on the section 23 consists the fracture section 33 of the temper shrimp DENSU section 31 by which connection formation was carried out in preparation for the lower limit section of the body 32 of a cap screwed on by blockading the opening top panel of the bottle can 1, and the body 32 of a cap, and has the composition of stopping the temper shrimp DENSU section 31 by the skirt-board section 24. Moreover, as shown in drawing 20 , in the upper part of the screw section 23, the part 27 in which the screw width of face a begins to be formed clearly is hereafter called screw beginning.

[0020] In drawing 1 and drawing 2 , the measuring device 2 consists of the table 50 holding the bottle can 1, the camera 51 arranged above the bottle can 1, cameras 52 and 53 arranged at the method of the outside of a side face of the bottle can 1, lighting systems 54, 55, and 56 formed corresponding to each cameras 51, 52, and 53, and a control section 57 which controls each above-mentioned component. The table 50 consists of [axis / the] rotary tables 59 rotated as a core in the rise-and-fall table 58 made to move the bottle can 1 in the vertical direction, and the bottle can 1.

[0021] Moreover, the lighting system 54 is formed annularly and the camera 51 is formed caudad. A camera 51 lets the interior of a lighting system 54 pass, and has composition which can picturize the bottle can 1 from the upper part. Lighting systems 55 and 56 are formed so that it may counter with cameras 52 and 53 on both sides of the bottle can 1. At this time, cameras 52 and 53 are arranged in the location estranged 120 degrees centering on the revolving shaft of the measurement table 50. in this case, the camera 52 -- the bottle can 1 -- especially -- a mouthpiece -- it is arranged so that the section 22 may be aimed at and it can picturize, and the camera 53 is arranged so that a shoulder 21 may be aimed at and it can picturize from the upper part of the drum section 20 of the bottle can 1. In addition, to the

bottle can 1, arrangement of the camera 52 will be carried out soon at the bottle can 1, and the camera 53 is estranged and arranged from the bottle can 1 from the camera 52.

[0022] The bottle can 1 laid on the table 50 as shown in drawing 1 and drawing 2 has composition picturized by coincidence with cameras 51, 52, and 53. It has composition which it rotates 120 degrees at a time to the circumference of the axis, measures the bottle can 1 similarly after the end of measurement by this image pick-up, and measures the parameter which will explain three places below on the periphery of the bottle can 1 by the time 240 degrees of bottle cans 1 rotate to the circumference of the axis.

[0023] In the gestalt of this operation, the item to measure is 14 items shown in drawing 5. That is, they are the overall length of a can, a head, skirt-board die length, curl width of face, screw thread height, a curl bore and roundness, a curl outer diameter, a screw thread outer diameter, a skirt-board outer diameter, a skirt-board root diameter, a skirt-board include angle, screw beginning height, and neck length. Measurement of a curl bore and roundness is made with a camera 51 among these parameters, the overall length of a can, a head, skirt-board die length, curl width of face, screw thread height, a curl outer diameter, a screw thread outer diameter, a skirt-board outer diameter, a skirt-board root diameter, a skirt-board include angle, and screw beginning height are measured with a camera 52, and neck length is further measured with a camera 53.

[0024] As shown in drawing 3, cameras 51, 52, and 53 perform these measurement by picturizing three points on the periphery of the bottle can 1, and it is measured by processing these image pick-up results in a control section 57. That is, the border line of the bottle can 1 is ****(ed) from the above-mentioned image pick-up result, and the dimension of each part of the bottle can 1 is measured based on this border line. Moreover, this measuring method makes the opening top panel of the bottle can 1 a criteria measurement line, **** it, and mainly measures it on the basis of this criteria measurement line.

[0025] the bottle can 1 laid in the table 50 in the measuring device 2 constituted as mentioned above as shown in drawing 3 -- first -- the top face of the bottle can 1 -- the point of measurement 3 of the bottle can 1 is picturized for the point of measurement 1 of the bottle can 1 to coincidence with a camera 53 a camera 52 with a camera 51. The bottle can 1 rotates to 120-degree clockwise rotation on a table 59 after the end of measurement at the circumference of the axis, and the point of measurement 2 of the bottle can 1 is picturized for the point of measurement 1 of the bottle can 1 to coincidence with a camera 52 a camera 53. After the end of measurement, further, the bottle can 1 rotates to 120-degree clockwise rotation at the circumference of the axis, and picturizes the point of measurement 2 of the bottle can 1 for the point of measurement 3 of the bottle can 1 to coincidence with a camera 53 a camera 52. By this, all the above-mentioned measurement will be made in three places on the periphery of the bottle can 1. Here, among the above-mentioned parameters, since it is only that one place exists on the periphery of the bottle can 1, screw beginning height is measured only in the point of measurement 1 in the case of 0 degree of angles of rotation. Measurement of each part is explained concretely below.

[0026] First, the bottle can 1 with which positioning of the hoop direction was made beforehand is laid on a table 50 with other equipments which are not illustrated. At this time, the bottle can 1 is arranged in the location which 90 degrees of that screw beginning section 27 estranged to the camera 52. And a normal coordinate is set up about the picture signal which ****(ed) with the camera 52. In this normal coordinate, the border line of the bottle can corresponding to the specification of the bottle can 1 measured is set up on a coordinate. Thus, after setting up, the border line of the actual bottle can 1 is ****(ed).

[0027] [measurement of a can overall length] -- in this condition, in measurement of the can overall length A, as first shown in drawing 6, a field W1 is set up near the bottle can 1 opening top panel near the medial axis of the bottle can 1. While obtaining the image data of a bottle can 1 opening top panel with the above-mentioned equipment 2 in a field W1, the criteria measurement line L1 is set up from change of the signal strength of this image data. That is, in the above-mentioned equipment 2, since a lighting system 55 is in a camera 52 and the location which counters as shown in drawing 1, the picture signal acquired with a camera 52 is a picture signal with which the silhouette of the bottle can 1 appeared in light. Therefore, the criteria measurement line L1 is called for by detecting change of this

picture signal reinforcement, i.e., the change part of brightness. Let the criteria measurement line L1 be the criteria in each measurement mentioned later besides the can overall length A. In order to compute the can overall length A from this criteria measurement line L1, first, an apparent vertical L2 is drawn a little in the location of the inner direction from the opening top panel left end P0 of the bottle can 1, and the Y coordinate value of the intersection P1 of the criteria measurement line L1 and an apparent vertical L2 is measured after that. The difference of the Y coordinate value at this time and the criteria Y coordinate value equivalent to the height corresponding to the specification of the bottle can 1 is computed, and an overall length A is computed by adding this calculation result to the module corresponding to the specification of the bottle can 1.

[0028] Since it measures by obtaining an image by the image pick-up with a camera 52 according to this measuring method, compared with the measuring method which contacts a gauge head with the bottle can 1 physically, it is highly precise and measuring for a short time is possible. Moreover, since it is based on screw beginning, it becomes possible to carry out measurement clear [the criteria of measurement], and always highly precise.

[0029] the mouthpiece of the following and bottle can 1 -- although the section 22 and each part of the near are measured, axis doubling of the bottle can 1 is performed before that. that is, the bottle can 1 was mentioned above -- as -- the beginning -- spinning and ironing -- a drum section 20 -- forming -- after that and neck-in processing -- a mouthpiece -- in order to form the section 22 -- the time of both processings -- setting -- a drum section 20 and a mouthpiece -- the case where the axis of the section 22 shifts -- it is -- this condition shifted -- it is -- a mouthpiece -- when measurement of the section 22 and its near is performed, there is a problem from which a suitable measurement result is not obtained.

[0030] In order to solve this problem, in the following measurement, it measures on the basis of the opening top panel L1, i.e., a criteria measurement line. that is, a setup of a coordinate is changed as shown in drawing 7 (A) and (B) -- making -- the criteria measurement line L1 -- a level coordinate -- carrying out -- a bottle can -- let the axis M of the section 22 be a vertical coordinate 1 mouthpiece.

[0031] A camera 53 performs measurement of [measurement of neck length] neck die-length B. First, as shown in drawing 8 , like the approach of obtaining the criteria measurement line L1 mentioned above, a field W2 is set as a shoulder 21, the tangent of this border line is extended by making the change part of brightness into a border line, and L2 is specified. Furthermore, similarly, W3 is set as a drum section 20 for a field, and L3 is specified. The intersection P2 with the above L2 and L3 is made into the intersection of a shoulder 21 and a drum section 20, and the neck length B is computed from the difference of the Y coordinate value of the above L1 and P2.

[0032] A camera 52 performs [measurement of head] head's C measurement. As shown in drawing 9 , first, a field W5 is set as the bulge section 26, and a field W6 is set as the bend of the upper limit of a shoulder 21, respectively. The change part of a picture signal is made into a border line into these fields W5 and W6, the productions L4 and L5 of this border line are obtained, and an intersection with these [L4 and L5] is set to P3. The difference of a Y coordinate value with the above L1 and P3 is calculated, and Head C is computed.

[0033] A camera 52 performs measurement of [measurement of skirt-board height] skirt-board height D. As shown in drawing 10 , first, a field W6 is set as the skirt-board section 24, change of a picture signal, i.e., change of brightness, is detected in a field W6, the border line of this part is ****(ed), and the high-order end P4 in the maximum tip section, i.e., drawing 10 , is specified in this border-line top. The difference of a Y coordinate value with the above L1 and P4 is calculated, and skirt-board height D is computed.

[0034] A camera 52 performs measurement of [measurement of curl width of face] curl width of face E. As shown in drawing 11 , first, a field W7 is set as a curl part, a border line is ****(ed) by the change part of a picture signal, i.e., change of brightness, in a field W7, and right end P5 are specified in the point, i.e., drawing 11 , of being most located on this border line in the inner direction. The difference of a Y coordinate value with the above L1 and P5 is calculated, and the curl width of face E is computed.

[0035] A camera 52 performs measurement of [measurement of screw thread height] screw thread height F. drawing 12 -- being shown -- as -- first -- a screw -- the section -- 23 -- a field -- W -- eight --

setting up -- a picture signal -- change -- namely, -- brightness -- change -- detecting -- this -- a part -- a border line -- ****(ing) -- this -- a border line -- inside -- two or more -- it is -- a screw thread -- a crowning -- inside -- drawing 12 -- setting -- a crowning -- P -- six -- P -- six -- ' -- inside -- most -- outside -- a way -- projecting -- a part -- namely, -- a high-order end -- P -- six -- ' -- detecting . Next, P7' most located in the inner direction among the troughs which have more than one is detected. And the difference of the X coordinate value of P6' and P7' is calculated, and screw thread height F is computed. [0036] [measurement of a curl section bore and roundness] -- a mouthpiece -- as shown in drawing 1 , measurement of curl section 25 bore of the section 22 picturizes the bottle can 1 from the upper part with a camera 51, and obtains the image of opening 25 top panel shown in drawing 13 (A) and (B). In this image, while passing along the center line O of the bottle can 1, a location can be shifted to the hoop direction of the bottle can 1, and a horizontal line 40 and the bore of the curl [set up 41...64 and] section 25 on the horizontal line of these plurality are measured, these bores are averaged, and it considers as the bore of the curl section 25. Among this average and the bore obtained by the above-mentioned measurement, a difference with maximum and the minimum value is calculated, and roundness is computed. In addition, although the bore of the curl section 25 was measured, you may make it measure the outer diameter of the curl section 25 in this example of measurement. furthermore, a mouthpiece -- it is possible to measure similarly about paths of each part, such as an outer diameter of not only the section 22 but the drum section 20.

[0037] A camera 52 performs measurement of the [measurement of curl section outer diameter] curl section 25 outer diameter G. Like ****, as shown in drawing 14 , fields W9 and W10 are set as one edge and other end of the curl section 25, respectively, and a border line is ****(ed) in each of this field W9 and W10, respectively. The opening 25 outer diameter G is computed from the X coordinate value of the high-order end in the field W9 on this border line, and the right end in a field W10.

[0038] A camera 52 performs measurement of [measurement of screw thread outer diameter] screw thread outer diameter H. Like ****, as shown in drawing 15 , fields W11 and W12 are set to one edge of the screw section 23, and the edge of the other end, respectively, and a border line is ****(ed) in this field W11 and W12, respectively. It sets to drawing 15 and the screw thread outer diameter H is computed from the X coordinate value of the high-order end P10 in the field W11 on this border line, and right end P11 in a field W12.

[0039] A camera 52 performs measurement of [measurement of skirt-board outer diameter] skirt-board outer diameter I. Like ****, as shown in drawing 16 , fields W13 and W14 are set to one edge of the skirt-board section 24, and the edge of the other end, respectively, and a border line is ****(ed) in this field W13 and W14, respectively. The bulge section outer diameter I is computed from the X coordinate value of the high-order end P12 in the field W13 on this border line, and right end P13 in a field W14.

[0040] A camera 52 performs measurement of [measurement of skirt-board root diameter] skirt-board root diameter J. Like ****, as shown in drawing 17 , fields W15 and W16 are set to one edge of the skirt-board trough 28, and the edge of the other end, respectively, and a border line is ****(ed) in this field W15 and W16, respectively. The skirt-board root diameter J is computed from an X coordinate value with the high-order end P15 in right end P14 and the field W16 in the field W15 on this border line.

[0041] A camera 52 performs measurement of [measurement of skirt-board include angle] skirt-board include angle theta. Like ****, as shown in drawing 18 , a field W17 is set to the lower limit section side of the skirt-board section 24, and a border line is ****(ed) in a field W17. Production L6 of the tangent of this border line is set up, and the include angle of the above L1 and L6 to accomplish is computed as a skirt-board include angle theta.

[0042] A camera 52 performs measurement of [measurement of screw beginning height] screw beginning height K. Like ****, as shown in drawing 19 , a field W18 is set up near the screw beginning section 27, and a border line is ****(ed) in a field W18. In the maximum tip section in the field W18 on this border line, i.e., drawing 19 , screw beginning height K is computed from the Y coordinate value of a high-order end P14 and the above L1.

[Translation done.]

*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the bottle can measuring device shown as 1 operation gestalt of this invention, and side view of the important section is carried out.

[Drawing 2] It is the outline block diagram of the bottle can measuring device of the operation gestalt shown in **drawing 1**, and plane view of the important section is carried out.

[Drawing 3] It is the explanatory view showing the physical relationship and the measurement part of a camera.

[Drawing 4] It is the explanatory view showing the contents of measurement.

[Drawing 5] It is the explanatory view showing a parameter and a measurement part.

[Drawing 6] It is the explanatory view showing how to measure the overall length of a bottle can.

[Drawing 7] It is an explanatory view at the time of correcting the location of a bottle can on a coordinate.

[Drawing 8] It is the explanatory view showing how to measure the neck die length of a bottle can.

[Drawing 9] It is the explanatory view showing how to measure the head of a bottle can.

[Drawing 10] It is the explanatory view showing how to measure the skirt-board height of a bottle can.

[Drawing 11] It is the explanatory view showing how to measure the curl width of face of a bottle can.

[Drawing 12] It is the explanatory view showing how to measure the screw thread height of a bottle can.

[Drawing 13] It is the explanatory view showing how to measure the curl bore of a bottle can.

[Drawing 14] It is the explanatory view showing how to measure the curl outer diameter of a bottle can.

[Drawing 15] It is the explanatory view showing how to measure the screw thread outer diameter of a bottle can.

[Drawing 16] It is the explanatory view showing how to measure the skirt-board outer diameter of a bottle can.

[Drawing 17] It is the explanatory view showing how to measure the skirt-board root diameter of a bottle can.

[Drawing 18] It is the explanatory view showing how to measure the skirt-board include angle of a bottle can.

[Drawing 19] It is the explanatory view showing how to measure the screw beginning height of a bottle can.

[Drawing 20] It is the explanatory view showing the screw beginning section of a bottle can.

[Description of Notations]

1 Bottle Can

51, 52, 53 Camera (image pick-up means)

L1 Criteria measurement line

40 41 Horizontal line

27 Screw Beginning Section

[Translation done.]

* NOTICES *

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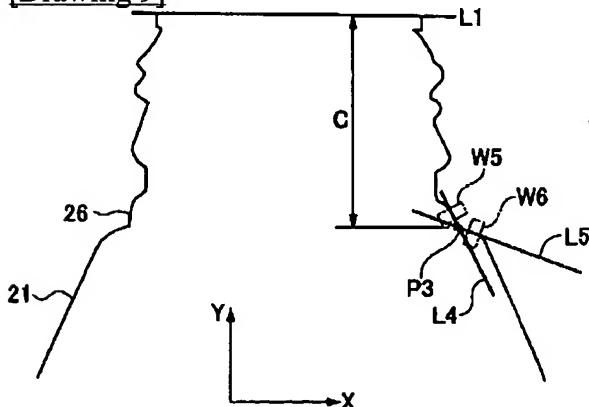
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2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

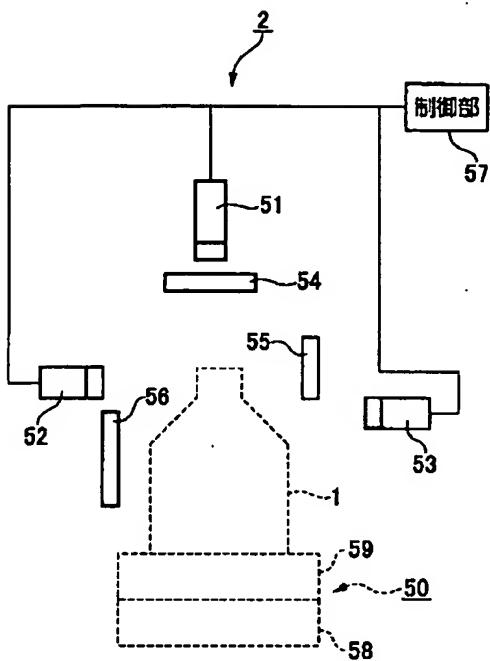
[Drawing 4]

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2	<ul style="list-style-type: none"> ・カメラ1:カール内径 ・カメラ2:全长、首長、スカート高さ、カール幅、ネジ山高さ、カール外径、ネジ山外径、スカート外径、スカート谷径、スカート角度 ・カメラ3:ネック長
3	<ul style="list-style-type: none"> ・カメラ1:カール内径 ・カメラ2:全长、首長、スカート高さ、カール幅、ネジ山高さ、カール外径、ネジ山外径、スカート外径、スカート谷径、スカート角度 ・カメラ3:ネック長

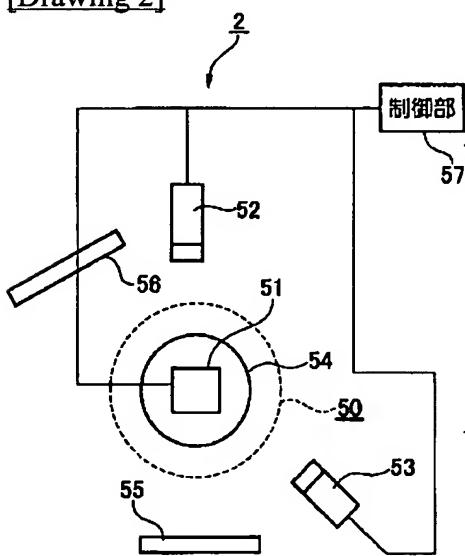
[Drawing 9]



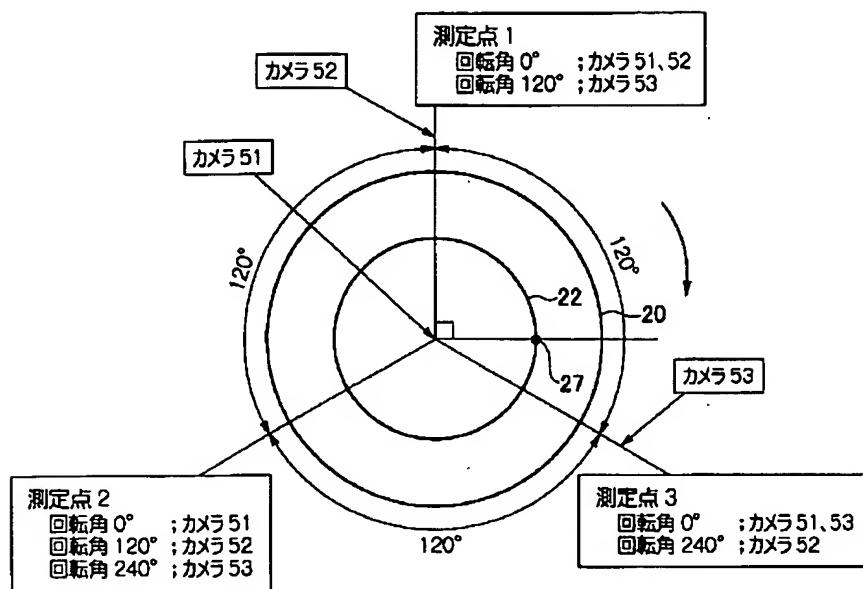
[Drawing 1]



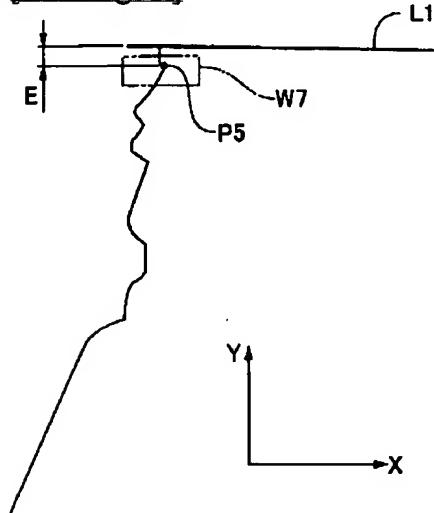
[Drawing 2]



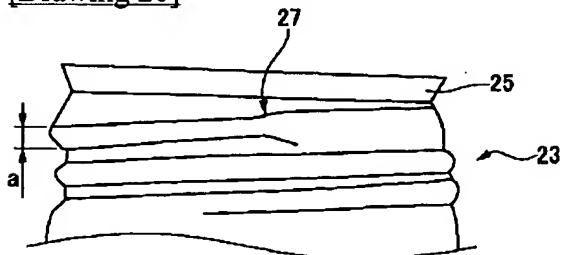
[Drawing 3]



[Drawing 11]



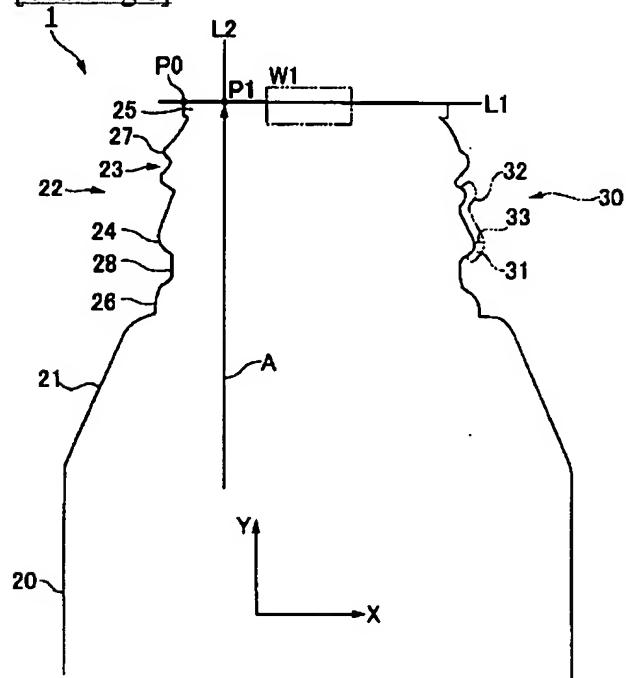
[Drawing 20]



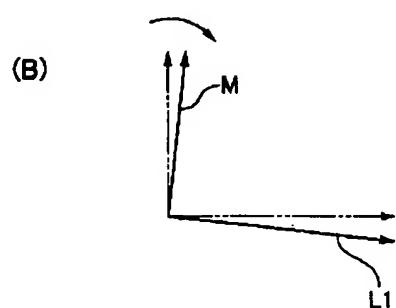
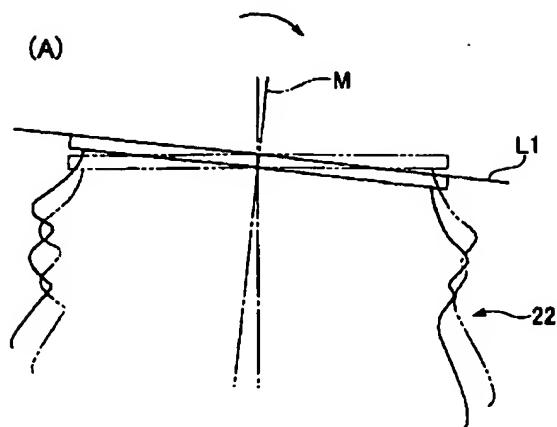
[Drawing 5]

測定項目	測定箇所
全長	0°、120°、240°毎に1箇所の測定実施
ネック長(肩長さ)	同上
首長	同上
スカート高さ	同上
カール幅	同上
ネジ山高さ	同上
カール内径 直径	同上
カール内径 真円度	同上
カール外径	同上
ネジ山外径	同上
スカート外径	同上
スカート谷径	同上
スカート角度	同上
ネジ始まり高さ	0°時のみ1箇所の測定実施

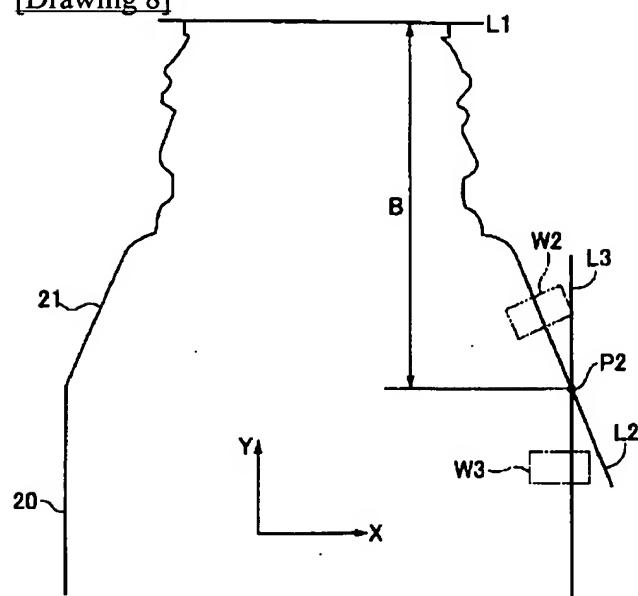
[Drawing 6]



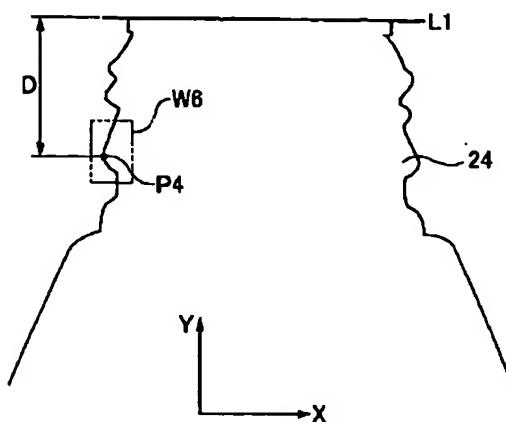
[Drawing 7]



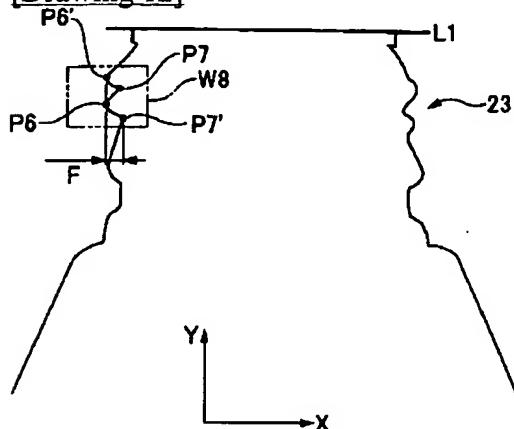
[Drawing 8]



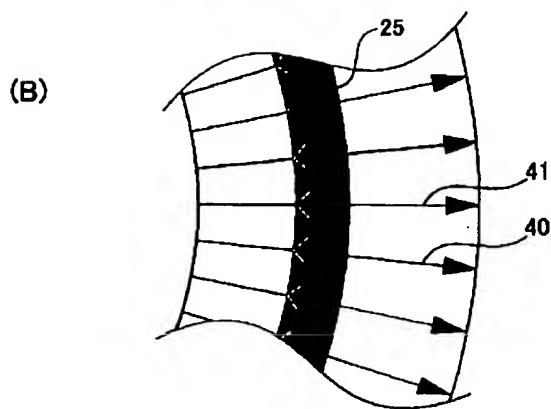
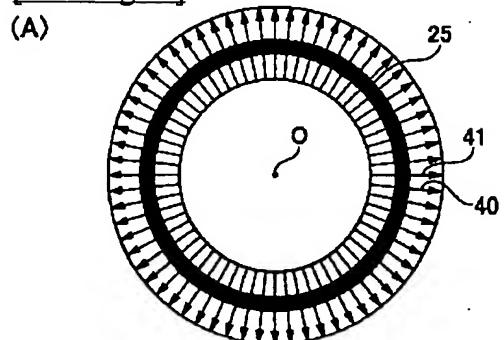
[Drawing 10]



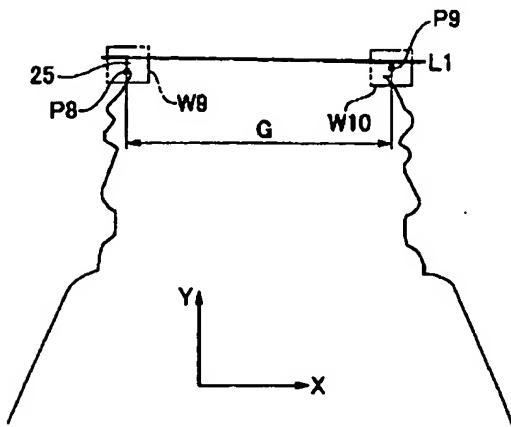
[Drawing 12]



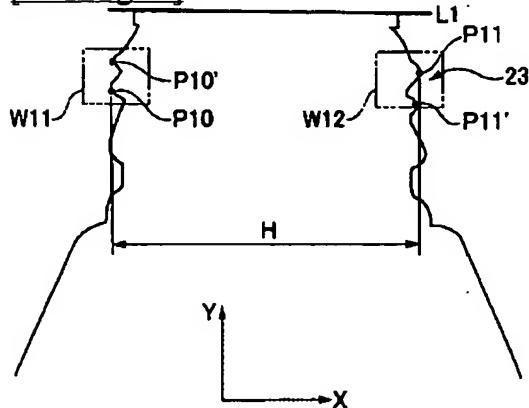
[Drawing 13]



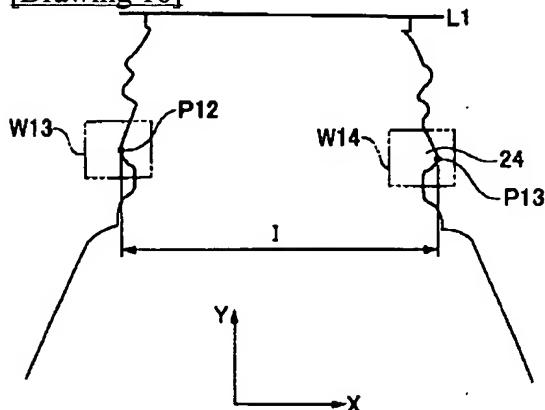
[Drawing 14]



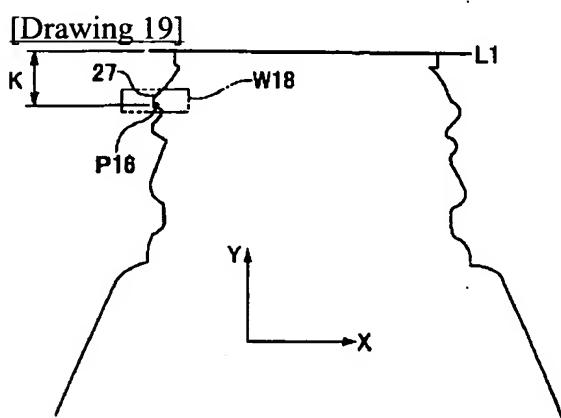
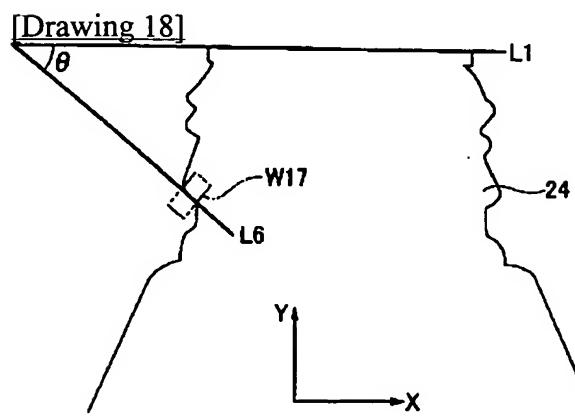
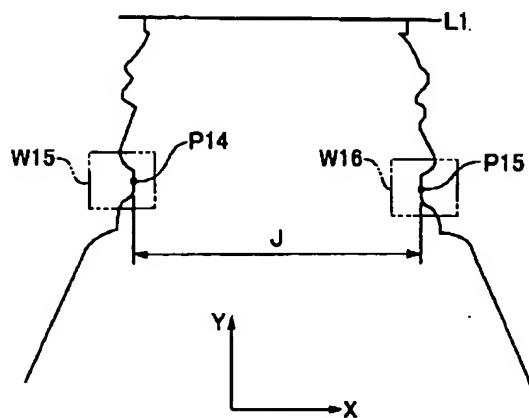
[Drawing 15]



[Drawing 16]



[Drawing 17]



[Translation done.]